

BANKSIA BEHAVING BADLY

By GREG KEIGHERY and BRONWEN KEIGHERY

Keiran McNamara Conservation Science Centre,
Department of Parks and Wildlife, Locked Bag 104,
Bentley Delivery Centre, Western Australia, 6983.

ABSTRACT

Six species of *Banksia*, *B. canei*, *B. hookeriana*, *B. integrifolia*, *B. sceptrum*, *B. seminuda* and *B. victoriae* show weedy characteristics when introduced by planting outside of their natural ranges in Western and Eastern Australia. *Banksia ericifolia* is currently a serious environmental weed in South Africa. The practice of planting non-local shrubs along major and minor roads is becoming a major source of new weeds invading fragmented bushland.

INTRODUCTION

Banksia species are rarely thought of as being weedy. In his global weed review Randall (2002) recorded only two species of the 74 known in *Banksia* (in the old sense before the addition of *Dryandra*). These were *Banksia canei* (mistakenly listed by Randall as *Banksia caleyi*, see George, 1999 and the herbarium voucher, Keighery 11031) and *B. integrifolia*. The review by Keighery (2013) of Western Australia (WA) natives as weeds did not list any banksias as being naturalised.

A number of *Bush Forever* sites (Government of WA 2000), were surveyed by the authors in 2012 and 2013. Several near coastal sites in the City of Stirling (Trigg Bushland, Bush Forever Site 308,

and Star Swamp Bushland Bush Forever Site 204) were visited to document weedy and native *Callitris* (Keighery 2012) for the city. An eastern site, Hartfield Park (Bush Forever Site 320), was also visited to update knowledge of the values of the site for a presentation. At two of these sites (Star Swamp and Hartfield Park Bushland) WA non-local *Banksia* species that were planted when vegetating the adjacent road reserves were spreading into the bushland.

This note presents information on the five *Banksia* species established as weeds in Western Australia and comments on a series of potential weedy forms. An additional Western Australian species is weedy in the east.

WEEDY BANKSIA RECORDS in WA

Eastern Australian species

Banksia canei

A naturally restricted species confined to subalpine areas of Victoria and New South Wales. In 1988 this species was recorded as spreading along road verges near the Porongurup Ranges in Western Australia (G.J. Keighery 11031). In this population the follicles of the old cones opened naturally on the shrub dropping seed into the soil, where they germinated after winter. According to George (1999) this was the first record of an indigenous Proteaceae as a weed. With numerous management activities along the road verge (widening, weed control and general verge maintenance) the population has slowly declined from a peak in the late 1990's of over 100 plants to a few mature plants remaining in 2010.

Banksia integrifolia var. *integrifolia*

Banksia integrifolia a widespread and variable species from Eastern Australia and is widely grown. The species is naturalised in New Zealand (Webb *et al.* 1995) on coastal areas on the North Island with one locality on the northern coast of the South Island (map in Landcare Research New Zealand 2014).

In Western Australia *Banksia integrifolia* has spread along a creek line at Hamel, an old forestry settlement south of Pinjarra (G. J. Keighery 17516).

This population most likely originated from now lost plantings of the coastal form at the Forest Department Nursery that once occupied the area. This variety grows from near Melbourne along the coast to Fraser Island off southern Queensland. There is also a report that this species has seeded and spread from plantings at the Banksia Farm in Mount Barker (R. Dixon, pers. com.).

WA species

Banksia hookeriana

This WA species grows naturally in a restricted area around Eneabba (south of Geraldton). This species is widely planted in Australia and was non-local roadside plantings on Marmion Avenue adjacent to Star Swamp (B.J. & G.J. Keighery 2157). In 2013 this species had established offspring both in the road reserve and the adjacent bushland that have flowered and fruited (Figure 1). The fire in 2010 burnt the roadside plantings resulting in the deaths of many of the shrubs that released more seed. Seedlings are well established from this event as well.

Banksia sceptrum

This WA species grows to the north of Perth from Mullewa to Shark Bay. This species was also planted in the road reserve on Marmion Avenue adjacent to Star Swamp but does not appear to have spread until after the 2010 fire.



Figure 1. Young *Banksia hookeriana* shrubs in Marmion Avenue Road verge (foreground) and adjacent bushland (on and behind the fence). Several cones of flowers can be seen on the shrub in the fence.

In 2013 there were numerous seedlings of *B. sceptrum* (Figure 2) in the road reserve (B.J. and G.J. Keighery 2156). Subsequent fires will see both *B. sceptrum* and *B. hookeriana* spreading further into the reserve.

Banksia victoriae

This is another relatively restricted species found to the north of Geraldton in the Northampton area. This non-local species was planted alongside the Roe Highway, which bisects Hartfield Park Bushland. In 2013 there were three mature plants remaining on the western side of the road reserve and a number within the bushland area. More than 13 mature

flowering and fruiting plants were observed (B.J. and G.J. Keighery 2181): three on the boundary track; six along the edge of an ephemeral drainage line; three in the open *Melaleuca preissiana* woodland adjacent to the drainage line (Figure 3); and another individual on an internal track.

Possible new weed – *Banksia seminuda*

There are other recordings of *Banksia* species as potential weeds, in the *Banksia* newsletter Liber (2004) noted

“The River *Banksia* (*Banksia seminuda*) has been increasingly cultivated in recent years and has proven to be a vigorous fast



Figure 2. Young self-sown *Banksia sceptrum* shrubs in the Marmion Ave road verge.

growing plant which can grow very large indeed. Of concern, there are reports emerging of weed potential. Seedlings have been found popping up near established plants in gardens at Warrambool and Colac, as well as the Cranbourne Annexe of the Melbourne Royal Botanic Gardens. Anyone else noticed this? I would be grateful for any other reports of this (or any other banksia setting seedlings)."

This species of riverine edges in the high rainfall region south of Pinjarra in Western Australia is probably of more concern as a weed in eastern Australia.

Possible new weeds – shrub forms of Western Australian *Banksia* species

Banksia menziesii is a common component of *Banksia* woodland from south of Pinjarra to Eneabba. Plants at the northern

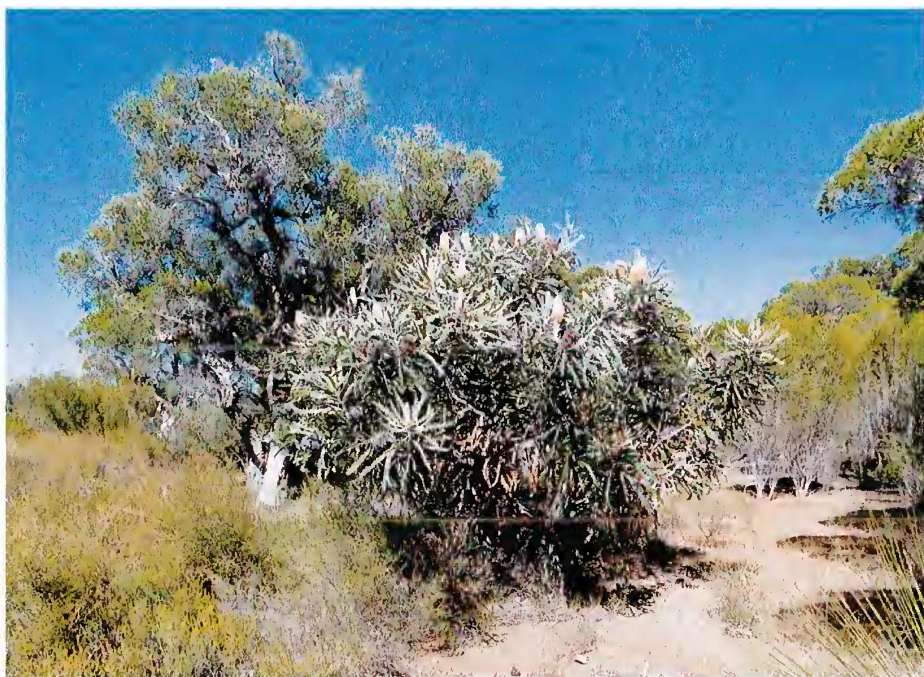


Figure 3. Young flowering and fruiting *Banksia victoriae* tree in the Hartfield Park Bushland.

extent are shrubs and at the southern extent low trees. Studies on these have shown that they vary from a tree to a shrub gradually as you travel north along the specie's range. The northern shrub form is grown in a number of places in the Perth Metropolitan Region. There are a number of plantings of the northern shrub form along the Freeway and other major roads in the Perth Metropolitan Region. These plantings have matured and have set seed. It will be interesting to see what form the offspring take after suitable disturbance. Especially noting that Hopper and Taylor

(1999) listed a series of actual and potential *Banksia* hybrids and noted that hybridization between local and introduced species could be an issue. The issue of genetic pollution between local and non-local forms in these species is obviously considerable, but remains to be documented.

This could also apply to other species, such as the northern forms (both a compact shrub and dwarf form) of *Banksia prionotes*, which has been widely planted on wildflower farms as well as along road verges (Brian Jack pers. com. Jack owned Western Flora and was the major supplier of the

dwarf form). Robert Dixon (pers. com.) of the Botanic Gardens and Parks Authority is of the opinion that this species is more likely to spread than *Banksia menziesii* as it produces large amounts of viable seed. Dixon also has a similar opinion in regard to the normal and dwarf forms of *Banksia ashbyi*.

Shrub forms are known for other widespread species of *Banksia*, including *B. attenuata*. Interestingly Cowling and Lamont (1985) have observed that both the tree and shrub form of this species co-occur at the Hill River without any intermediates.

DISCUSSION

Landcare Research New Zealand (2014) notes that cultivated *Banksia aemula*, *B. ericifolia* and *B. serrata*, have had individual plants recorded as spontaneous outside of cultivation. *Banksia ericifolia* is now naturalised in South Africa and is considered a potentially serious weed of heathland (Geerts *et al.* 2013). Although cultivated in Western Australia we know of no weedy occurrences of any of these species.

The Western Australian *Banksia* species listed as weedy in this paper are outbreeding and several do not set seed in isolation (G.J. Keighery unpub. obs.). However if more than one seed sourced plants are planted visits by honeyeaters can affect cross-pollination. All plants were found to produce cones with

large numbers of fertile seed. Interestingly Lamont *et al.* (1994a) demonstrated that roadside plants of *Banksia hookeriana* in their natural habitat were larger and more fecund than those in adjacent undisturbed bushland. A similar effect was recorded for *Banksia menziesii* (Lamont *et al.* 1994b).

As noted previously the potential for hybridization and genetic pollution with both local species and local forms of such outcrossing species in these cases is considerable, but remains to be documented.

The pathways by which weeds establish in fragmented bushland are diverse, but are typically associated with the bushland remnant being under stress from a series of disturbance events. The planted *Banksia* populations initially establish feral populations after the appropriate disturbance event, which in most cases is a fire. All but one (*B. integrifolia*), of the *Banksia* species recorded as establishing naturalised populations in areas of Mediterranean climate are killed by fire and regenerate en masse from seed. Fortunately only a small fire occurred at Starr Swamp and currently none at Hartfield Park.

In the case of native species becoming weeds in local bushland Keighery (2013) found that nearly all cases were from nearby deliberate plantings, including: gardens; 'enrichment plantings'; and planting for revegetation and rehabilitation. This appears

to be the case for all weedy *Banksia* species worldwide.

Current road verge revegetation typically uses local species or at least native plants, which has many benefits to local wildlife. However, when planted adjacent to bushland the aim should be to use only local species, or there may be unintended consequences. Roadside plantings adjacent to Hartfield Park have resulted in a suite of non-local native species invading the bushland. Spreading species include: Western Australian species such as *Banksia victoriae*, *Chamelaucium uncinatum*, *Eucalyptus camaldulensis*, *Grevillea leucopeteris* and *Melaleuca nesophila*; and Eastern Australia species such as *Eucalyptus botryoides* and *Melaleuca armillaris*. Invasion by these widespread species will not add to the biodiversity values of this important regionally significant remnant, which contains both endangered communities and species, rather they will compromise them. Use of local species, sourced from the local area, can complement an adjacent bushland area.

Road verge plantings tend to use species that readily and rapidly grow from seed. Plantings are of numerous individuals who are tended till established, and once established, may be more fecund than in their natural habitats. This overcomes several of the blocks of dispersal, growth and establishment that prevent these species invading adjacent remnants. The authors believe that

this is becoming a major avenue for new weeds to invade urban and roadside remnants. This is a reminder that almost anything can be a weed given the correct combination of climate, site and circumstance.

ACKNOWLEDGEMENTS

Robert Dixon of the Botanic Gardens and Parks Authority whose broad knowledge of the horticulture of Western Australian plants considerably improved the information presented in the paper.

REFERENCES

- COWLING, R.M. and LAMONT, B.B. 1985. Variation in serotiny in three *Banksia* species along a climatic gradient. *Australian Journal of Ecology* 10: 345–350.
- GEERTS, S., MOODLEY, D., GAERTNER, M., MUOFHE, C., RICHARDSON, D.M. and WILSON, J.R.U. 2013. The absence of fire can cause a lag phase: The invasion dynamics of *Banksia ericifolia* (Proteaceae). *Austral Ecology* 38: 931–941.
- GEORGE, A.S. 1999. *Banksia. Flora of Australia*. Volume 17B, Pp. 175–250. CSIRO Publishing, Melbourne.
- GOVERNMENT OF WESTERN AUSTRALIA 2000. *Bush Forever. Volume 2 – Directory of Bush Forever Sites*. Department of Environmental Protection, Perth, Western Australia.
- HOPPER, S.D. and TAYLOR, A.

1991. The Banksia Atlas. *Australian Flora and Fauna Series No. 8*. Australian Government Publishing Service, Canberra.
- KEIGHERY G.J. 2012. *Status of Callitris in Star Swamp, Trigg Dunes and Jeanes Prisk Reserve, Karrinyup, City of Stirling*. Report to City of Stirling. Department of Environment and Conservation, Kensington, WA.
- KEIGHERY, G.J. 2013. Weedy native plants: an annotated checklist. *Conservation Science Western Australia* 8: 259–275.
- LAMONT, B., REES, G., WITKOWSKI, E. and WHITTEN, V. 1994a. Comparative size, fecundity and ecophysiology of roadside plants of *Banksia hookeriana*. *Journal of Applied Ecology* 31: 137–144.
- LAMONT, B., WHITTEN, V., WITKOWSKI, E., REES, G. and ENRIGHT, N.J. 1994b. Regional and Local (Road Verge) Effects on Size and Fecundity in *Banksia menziesii*. *Australian Journal of Ecology* 19: 197–205.
- LANDCARE RESEARCH NEW ZEALAND 2014. Plant Names Database (<http://nzflora.landcareresearch.co.nz/> accessed 4/4/2014).
- LIBER, C. 2004. Species Weed Alert: *Banksia seminuda*. Association of Societies for Growing Australian Plants, *Banksia Study Group Newsletter* Issue 9: Vol. 6, No. 1, page 2.
- RANDALL, R.P. 2002. *A Global Compendium of Weeds*. R.G. and F.J. Richardson, Melbourne.
- WEBB C.J., SYKES, W.R., GARNOCK-JONES, P.J., and BROWNSEY, P.J. 1995. Checklist of Dicotyledons, Gymnosperms and Pteridiophytes naturalised or casual in New Zealand: additional records 1988–1993. *New Zealand Journal of Botany* 33: 151–182.